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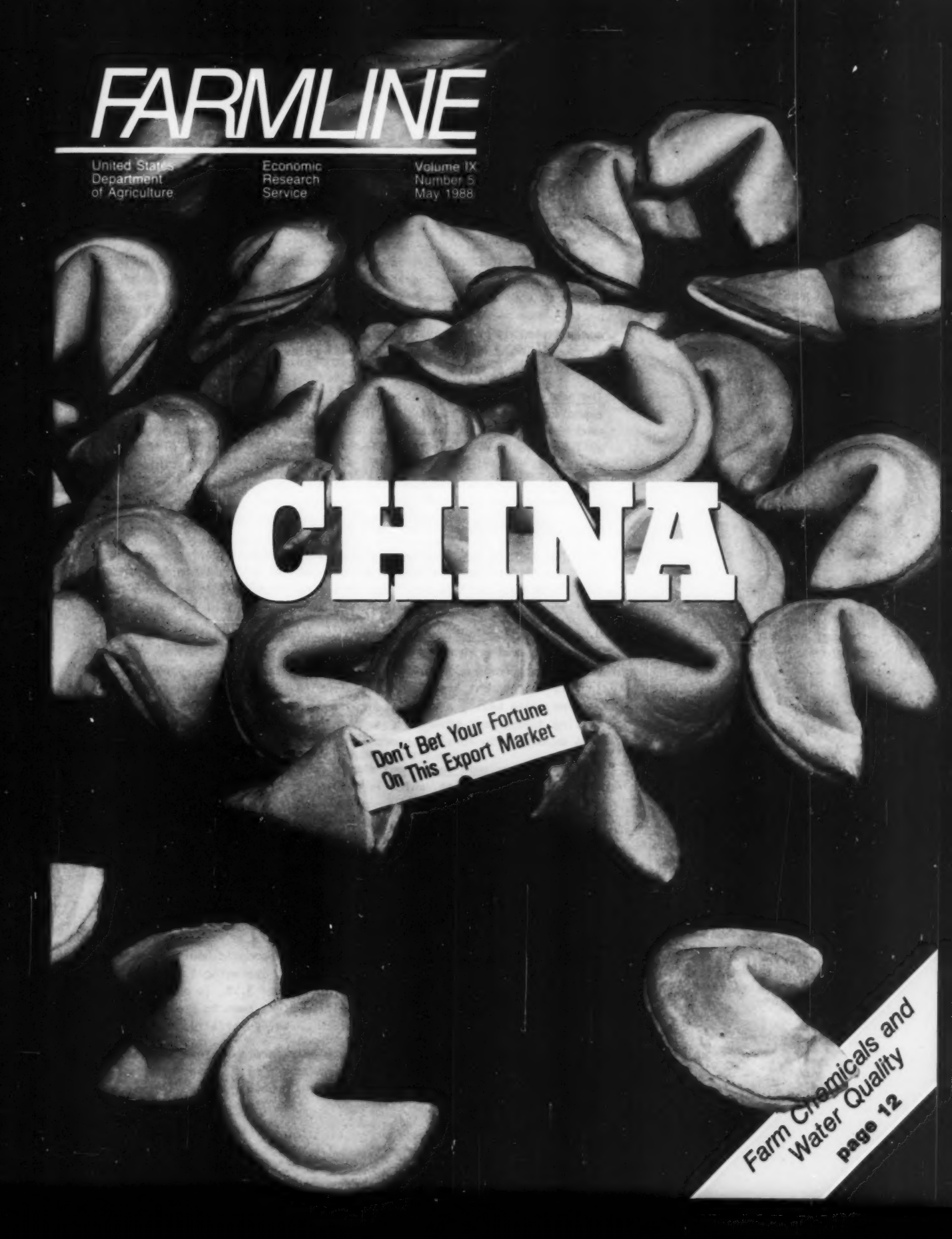

CHINA

Don't Bet Your Fortune On This Export Market

Farm Chemicals and Water Quality
page 12

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The Secretary of Agriculture has determined that publication of this periodical is necessary in the transaction of public business required by law of this Department.

PERSPECTIVES

GENERAL ECONOMIC CONDITIONS "are not expected to make or break the U.S. agricultural sector" during the next 18 months, says economist Ralph Monaco of USDA's Economic Research Service. This will be one of those periods when macroeconomic factors aren't likely to set the course for agriculture. By contrast, during the early 1980's, recession, a strengthening dollar, and high interest rates were a major part of agriculture's problems.

The analyst is optimistic about the U.S. economy in general, and expects basically a "replay" of 1987 conditions. Specifically, for the next year and a half, he believes that real GNP (gross national product) is likely to grow at a rate of about 3% annually, inflation will not accelerate significantly (probably running from 3.5% to 4%), interest rates will remain stable (perhaps rising slightly by the end of 1988), and unemployment will continue its slow decline.

Other details of Monaco's analysis include:

Both the federal budget deficit and the U.S. trade deficit should continue to improve. The budget deficit fell to $150 billion for fiscal 1987, from $221 billion in fiscal 1986. The trade deficit improved in real terms by $10 billion in 1987, the first substantial gain since 1980.

U.S. exports (agricultural and nonagricultural) are likely to continue increasing during 1988. In real terms, exports jumped more than 12% last year, after growing 3% in 1986 and declining 2.5% in 1985. The key factor in this improvement has been the decline in the value of the dollar. That decline began having a significant effect on exports in mid-1986. (A falling dollar puts upward pressure on import prices and makes U.S. goods less expensive to foreign buyers.)

Exports and business investment should continue to drive the current U.S. economic expansion, which is now in its sixth straight year. (In 1983-86 the economy was led by consumer and government spending.) Of course, there is always a possibility of a surge in inflation, a recession, or both, but only in the event of "some dramatic shock or policy change." The major downside risks are an increase in oil prices, an upturn in inflation caused by demand outpacing growth in production capacity, or a rapid fall in the value of the dollar. On the other side, if unexpected improvement occurs, it probably will be in the area of greater exports and fewer imports.

Real GNP, the most comprehensive indicator of economic health, has done very well since 1982, the last recession year, averaging 3.1% growth annually. A similar rate, and perhaps as much as 3.5%, is expected during the next year or two. In general, positive signs seem to prevail over recent concerns about deficits and stock market volatility.

Prospects for the rest of the world are less favorable than for this country. Low export earnings and high debts are still a serious problem for many developing countries. And economic growth remains uneven around the world.

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AGRICULTURE . . . NATURAL RESOURCES . . . RURAL DEVELOPMENT
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FEATURES

Increase in Exports to China May Be Temporary *by Jack Harrison* 4

An increase in consumer demand for food in China has occurred at the same time farm production has leveled off. This has resulted, temporarily, in larger U.S. sales of farm products. But prospects for further growth in sales are uncertain, as China continues to work toward its goal of self-sufficiency in food production.

Tax Law Change Could Affect Equipment Buying *by Judith Foulke* 8

The elimination of the investment tax credit and other provisions in the 1986 Tax Reform Act may affect spending on farm capital—machinery, equipment, and buildings. ERS economists have analyzed the potential impact of these changes. The tax credit reduced the cost of investment to farmers but also may have helped encourage surplus production.

Balance Sought Between Farm Chemicals, Water Quality *by Doug Martinez* 12

Protecting water supplies from possible contamination by farm chemicals may mean changes for agriculture, even under laws already on the books. The situation is complex, and the farmer's interest involves health considerations, possible new restrictions on the use of chemicals, and changing levels of profitability.

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This handy guide provides telephone numbers of key specialists in USDA's Economic Research Service and National Agricultural Statistics Service. The listings are arranged by subject, to help you find the right person to answer questions about crops, livestock, farmland prices, trade, and other topics. Clip and save the guide.

Increase in Exports To China May Be Temporary

Pork, eggs, and sugar have been rationed in recent months in China's major cities, because of increased consumer demand at a time when agricultural production has leveled off.

After an impressive spurt in food production from 1979 to 1984, China's farm sector is again struggling to keep up with a growing population and rising incomes. The reemerging gap between supply and demand is a factor in China's purchase of 5.2 million tons of U.S. wheat since early 1987 under the Export Enhancement Program.

For U.S. farmers and ranchers, however, the food shortages probably do not represent an opportunity for much additional export selling in the short run (except for EEP sales), says Francis Tuan, an economist with USDA's Economic Research Service. The reasons for limited export opportunities include China's reluctance to increase its dependence on imports.

"Consumer demand for food is up substantially in China, because economic reforms increased personal income," Tuan says.

Under a sweeping reorganization of farm production units and policy between 1979 and 1984, a "household contract responsibility system" was created, and nearly all communes were disbanded. Farm households began making their own production and marketing decisions. Government procurement prices for grains and livestock were increased. Output and income rose sharply, as farm families responded enthusiastically to the new system.

In 1981, private plots and rural trade markets (also known as free markets) expanded. Farmers' income is now tied to production, creating greater incentives for the agricultural sector.

Less Control for Government

"The household agriculture system has generally been good for the farmers," Tuan says, "but the government has lost a lot of control over farming." China's minister of agriculture, He Kang, said recently that "One reason for farmers' lack of enthusiasm for raising grain, pigs, cotton, and sugarcane is that the state pays such low prices for these commodities."

Despite recent rationing and increased wheat imports, China remains committed to its goal of self-sufficiency in food production.

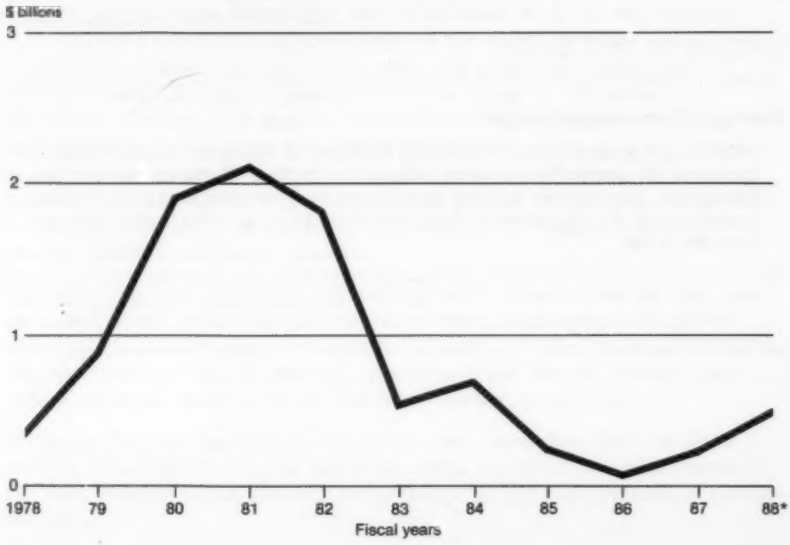
After production of farm commodities shot upward under the household system, the government found that it was very expensive to purchase all that was produced, so some prices were trimmed, and amounts purchased were cut back. And the marketing infrastructure (storage, processing, and transportation facilities and systems) was not sufficient to handle the output.

Government investment in the agricultural infrastructure has dropped in recent years to 3.4 percent of the country's total capital construction investment. The average had been 11.9 percent in the 30 years before 1980, according to the government of China. Tuan says that the lack of investment in irrigation facilities, land improvements, and farm mechanization probably will continue to hold down gains in farm production. China also has a shortage of most forms of energy, including diesel fuel and electricity.

Preferred food items, such as red meats, eggs, and sugar, have been in greater demand during the last few years because the people of China simply had more money to spend, Tuan says. Annual spending on consumer products by the rural population increased from $38.23 per person in 1978 to $93.83 in 1985, according to information from the government.

Urban residents have increased their incomes and spending at a slower pace, but they remain substantially better off than the rural residents. In 1985, urban residents had 133 percent more money to spend on consumption than did their rural counterparts.

U.S. Agricultural Exports to China Are Trending Upward, But Still Far Below the Peak Years of the Early 1980's



*Forecast.

China has now had 4 years in a row of agricultural trade surpluses. In 1986, exports totaled $6.1 billion worth of farm products, while imports were valued at $2.7 billion. China had been a net exporter of agricultural commodities during most of the 1960's and 1970's. Then it slipped into a deficit position in the early 1980's. The agricultural trade surplus returned, and grew, after 1983, but declined last year.

Because of the increase in domestic demand, China's exports of farm products, especially grain, have decreased substantially. China was a net grain importer in 1987, after 2 years of exporting more grain than it imported.

China's farm exports go mainly to Asian nations. Among its top products and markets are corn and soybeans to the Soviet Union and Japan.

The United States exported only $235 million worth of agricultural products to China in 1986/87. For 3 years in the early 1980's, U.S. sales of farm commodities to China averaged nearly $2 billion annually.

China's government was never committed to a policy of permanently increasing reliance on foreign sources of basic commodities, Tuan says. The increased imports in the late 1970's and early 1980's were considered temporary. And in 1983 and 1984, imports did drop substantially.

For about 20 years prior to the late 1970's, China's total agricultural output did not increase. From 1978 to 1984, annual growth in production exceeded 9 percent. But since 1985, the rate has been only 3 percent.

Rice Is the Main Crop

China's leading grain crop is rice, with an estimated total production of 175 million tons in 1987. Production of coarse grains last year totaled 96 million tons, wheat output was 87 million tons, and oilseeds totaled 33 million tons.

Meeting its wheat needs will be China's biggest food problem, Tuan says, because only a limited amount of land is suitable for wheat production. Wheat is used in China mainly for making noodles and buns, not for bread as in the United States and other Western countries.

China's farmers also produced 58 million tons of sugarcane and sugar beets in 1987, 4.19 million tons of cotton, and 17.8 million tons of pork, but only 1.4 million tons of beef and mutton together. Cattle in China are used mainly for field work and transportation, not for meat. In 1985 about 4.6 million head of cattle were slaughtered, less than 6 percent of the total herd.

(continued on next page)

Diet in China Changing Rapidly

China has more than four times the population of the United States, a slightly larger land area, and only half as much farmland.

Much of the country is mountainous or otherwise unsuitable for cultivation. And China also has been losing cropland to building construction and other nonagricultural uses. This makes it difficult to increase food production to keep up with population growth.

The population is already huge—more than 1 billion—and increased by 15 million during 1987 alone.

China's cropland is farmed intensively. Double-cropping and even triple-cropping are common.

The diet of the Chinese people is much different from the American diet, as well. U.S. consumers eat several times as much meat. In 1985, China's urban residents each consumed an average of 44.4 pounds of red meat, while for rural residents the average was 24.2 pounds, says economist Frederick Crook of USDA's Economic Research Service. Pork has accounted for 85 to 95 percent of the meat in China's diet. By contrast, U.S. annual per capita consumption is about 75 pounds of beef and 60 pounds of pork.

Poultry makes up another 70-80 pounds per person in the American diet. But China's rural residents consumed only 2.3 pounds of poultry meat per capita in 1985, and the city dwellers 8.4 pounds. China's people also eat 4 to 6 pounds of seafood per person each year.

The amounts of red meat and poultry in the diet in China are still comparatively small, but consumption has been increasing rapidly, Crook says. From 1978 to 1985, per capita consumption of red meat was up by 90 percent in the rural areas. Urban areas also registered increases, although not as great.

Both rural and urban consumers in China were spending about 58 percent of their budgets on food in 1985, several times the percentage in the United States. With higher incomes since the economic reforms, however, spending on food as a percentage of personal consumption in China has dropped nearly 10 percent.

The increase in personal income has led to diversification of food demand in China and a greater variety of items produced. The food processing industry has been expanding rapidly, because of the more sophisticated tastes. In the first half of this decade, the demand for processed items such as canned meat and beer grew by more than 200 percent. Newly introduced products in recent years include potato chips, fruit juices, cola drinks, ice cream bars, soybean milk, and infant milk powder.

Another reason that China's government is interested in expanding its food processing industry is to compete in international markets and earn more foreign exchange.

Grain production in China has leveled off during the last few years. It totaled 407 million tons in 1984, 379 million tons in 1985, 391 million tons in 1986, and 402 million tons in 1987.

During the 1978-84 period, yields of wheat, rice, coarse grains, and oilseeds increased rapidly, mainly because of greater use of fertilizer and other chemicals, improved varieties, better management, and more specialization, Tuan says. The cultivated area in China was estimated at 237 million acres in 1987, down 2.2 percent in 4 years.

Cotton production in China was 4.2 million tons last year, 3.5 million in 1986, 4.2 million in 1985, and 6.1 million in 1984. After the reforms of the late 1970's went into effect, production was so large that surpluses were accumulated. The government therefore limited cotton production for 2 years. But bad weather in 1985 held down the output, and production controls have not been in effect since.

Meat production increased at an annual rate of 12 percent between 1979 and 1986. But pork output dropped slightly in 1987.

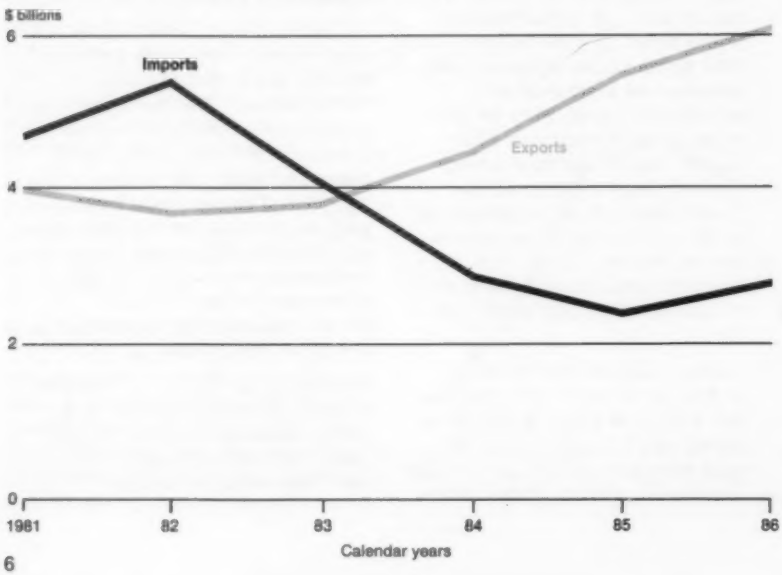
Two Market Systems Used

China has two food distribution systems. In the primary system, prices are set by the government (but supplies may be inadequate). In the secondary "free market" system, supply and demand come into play, and prices are often 30 to 50 percent higher. Sellers set the prices in those markets, and the government taxes the sales. Despite food shortages, those consumers with sufficient money can get what they want, Tuan says.

China's highway and railroad system is poor, so food tends to be consumed near where it is produced.

Tuan says that the increase in farm production in the last 10 years represents basically a one-time growth spurt resulting from restructuring of an inefficient farming system, which did not have incentives for individual farmers and families. Other reasons for the slowdown in growth since 1984 include a decline in the area devoted to grain crops, diversion of inputs (especially fertilizer) from grains to other uses, unfavorable prices on inputs, and bad weather.

China Has Exported More Agricultural Commodities Than It Has Imported Since 1983



For U.S. farmers, the big question is whether China's food needs will translate into larger purchases of American commodities. For the immediate future, the prospects still appear to be limited, Tuan says.

China remains committed to the goal of self-sufficiency in farm production, despite its problems in keeping up with consumer demand. The U.S. wheat that China has purchased in the last year was bought at discounted prices under the Export Enhancement Program, and China recently announced a new program to spur grain production by allowing supply and demand to help determine prices in two regions. Problems or policy changes could occur at any time, but economists do not see any evidence yet that China is ready to respond to growing demand by substantially increasing its reliance on U.S. or other outside suppliers. □

[Based primarily on information furnished by economist Francis Tuan of the Agriculture and Trade Analysis Division, Economic Research Service.]

Dairy Product Demand Analyzed

The 1980's brought at least one piece of good news for the dairy industry. Something happened to reverse the 40-year decline in per capita consumption.

Back in 1939, the average American consumed 824 pounds of milk, cheese, butter, ice cream, and other dairy foods. By 1981, average use was down to 542 pounds.

Then, per capita consumption started to rise again. In 1985 and 1986, it averaged 594 pounds per person—the highest level since 1965.

According to this report, two factors are mainly responsible for the recent upturn: rising consumer incomes and the competitive pricing of retail dairy products relative to other foods. The study identifies the various factors that affect per capita consumption of dairy products. It goes on to assess the relative importance of each of those factors.

The analysts confirm that dairy product use has been influenced by advertising and promotion, concerns about nutrition and health, donations through food assistance programs, and several socioeconomic and demographic changes in the U.S. population. However, they conclude that two economic forces have had a greater role than all the others in bolstering per capita consumption.

First, retail prices for dairy products have risen less than prices for most other foods during the 1980's. Relative prices play a major role in consumer selections between dairy products and various substitute foods.

Second, consumer incomes have increased at a faster pace. Although the effect of income varies for different products, consumption of cheese tends to rise with income. Cheese accounted for most of the recent increase in per capita dairy food use.

Consumer Demand for Dairy Products *by Haidacher, Blaylock, and Myers. (Published March 1988; 78 pages of text, charts, and tabular data; GPO Stock No. 001-019-00579-3; $4.00.)*

Farmland Drainage: A Changing Story

Today, much of the Corn Belt might be a vast, mosquito-infested marsh if it were not for settlers who drained off the water so the land could be farmed. Swamps and water-saturated soils were once common in such states as Iowa, Indiana, Illinois, and Ohio.

Drainage is part of the story of the development of American agriculture, but it's a changing story, with changing policies, technologies, and costs and benefits.

In general, drainage removes excess water from the soil, allowing crops to grow, reducing surface runoff, and permitting machinery onto the fields. It can also help reduce soil erosion.

At the same time, however, some forms of drainage alter the landscape, eliminating wetlands that serve as the habitat for waterfowl and other wildlife. In addition, drainage water sometimes contains toxic concentrations of natural elements and heavy salt deposits. Drainage can also alter hydrologic processes that contribute to water quality or flood control.

Until a few years ago, government policy generally tended to encourage drainage. More recently, the pendulum has swung in the other direction, with growing support from both the farm community and the public for laws to preserve the remaining wetlands.

This cooperative USDA-university report goes far beyond history and environmental issues. Its chapters on drainage technology, engineering and design principles, and the economics of farm drainage should be useful to consultants, contractors, and extension agents.

Farm Drainage in the United States: History, Status, and Prospects. *(Published December 1987; 170 pages in 13 chapters by various authors; illustrated; GPO Stock No. 001-019-00518-1; $9.00.)*

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Tax Law Change Could Affect Equipment Buying

Depressed economic conditions in U.S. agriculture over the last several years have substantially reduced spending on farm machinery, equipment, and buildings. The diversion of an increasing number of acres through government farm programs also contributes to the lower demand for equipment.

Recent improvement in the farm economic picture will probably stimulate some additional investment. However, the elimination of the investment tax credit in the 1986 Tax Reform Act is likely to reduce the incentive for adding to agriculture's capital stock.

That is the conclusion of economists Roger Conway, Ron Durst, James Hrubovcak, and Michael LeBlanc of USDA's Economic Research Service. They developed an econometric-simulation model to isolate and measure the potential impacts of various provisions of the 1986 Tax Reform Act (including the removal of the investment tax credit) on capital investment in farm machinery.

The study does not consider changes in other factors, such as inflation, interest rates, or prices received by farmers. Therefore, the analysts say, their results are not predictions of future investment, which will be influenced by many factors in addition to the 1986 changes in tax laws.

Tax Credit Was 6-10 Percent

Prior to 1986, farmers could claim an investment tax credit of 6–10 percent on certain capital items acquired and placed in service during the tax year. Qualifying farm property included machinery, equipment, livestock purchased for dairy, draft, breeding, or sporting purposes, storage facilities, and single-purpose agricultural structures, such as broiler houses.

The tax reform legislation reduced the burden on many taxpayers by lowering tax rates but also eliminated some provisions which had reduced taxes. The investment tax credit was one of those provisions. To balance the loss of government revenue, the investment tax credit was repealed retroactively to January 1, 1986, a year before the effective date for most other changes under the act.

Tax policy is an important factor in farmers' investment decisions, but tax incentives for investment have sometimes caused distortions.

The investment tax credit was introduced into the law in 1962 to give the economy a boost by encouraging business investment. LeBlanc says the measure was intended to help increase economic growth and employment. However, as the economy experienced ups and downs, the investment tax credit was repealed in 1969 and re-enacted in 1971. In addition, it was modified in various ways between 1962 and 1986.

In earlier research, LeBlanc and Hrubovcak determined that various tax policies between 1956 and 1978 stimulated net investment in agricultural equipment by more than $5 billion and net investment in agricultural structures by more than $1 billion. Their figures are in inflation-adjusted 1977 dollars. They add that tax policy resulted not only in greater investment in agriculture, but also in increased potential production.

Since 1980, net investment in farm machinery has been negative. Negative net investment occurs when capital expenditures (purchases of machinery and equipment) aren't large enough to match the decline in the value of existing capital items due to depreciation.

Net investment could turn around if the outlook for the farm economy continues to improve. Economists contend, however, that the absence of the investment tax credit will reduce the stimulus for investment even if farm profitability increases.

The U.S. stock of farm machinery and equipment was valued at an estimated $16.5 billion in 1987 (measured in 1972 constant dollars). Net investment for 1987 was estimated to be about minus $2.9 billion.

If the tax law had not been changed, the analysts say, they would have expected the value of capital stock to be higher. Net investment would still have been negative, but somewhat less so. Analysis by the economists indicates that by 1991 the value of agriculture's capital stock would be $1.7 billion lower than it might otherwise be because of the elimination of the investment tax credit. Other provisions of the Tax Reform Act would lower investment by about $200 million, according to the simulation model.

Farmers Consider Tax Policy

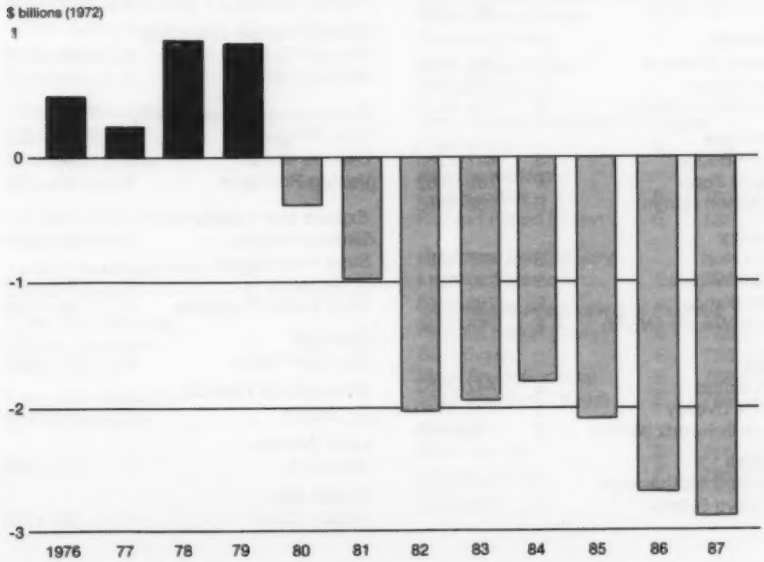
Economists say taxes have historically been an important factor in farmers' investment decisions. However, incentives in tax policy for investment have sometimes caused distortions in production and consumption.

The dairy industry is cited as an example. Economist Durst says that over the years, particularly in the mid-1970's, the dairy industry benefited from certain tax rules. For instance, with milking facilities treated like machinery for tax purposes, dairy producers could claim the investment tax credit and depreciate their assets faster. This and other tax provisions helped stimulate investment in the dairy industry, despite a mounting surplus of dairy products, Durst says.

Federal tax law had been created in a piecemeal fashion since 1954, the economists note. Numerous preferential provisions inserted into the tax code and the attempts to limit their application to targeted groups led to a tax system that by 1985 was a complicated maze of rules which failed to direct resources to the best and most efficient uses, according to the analysts. Policymakers therefore saw a

Although an improving farm economy has meant that more farmers are shopping for tractors and other equipment, analysts say that investment would probably be somewhat higher with the added incentive of a tax credit. (Photo from *Farm and Power Equipment Dealer* magazine.)

Net Investment in Farm Machinery and Equipment (New Purchases Minus Depreciation) Has Been Negative Since 1980



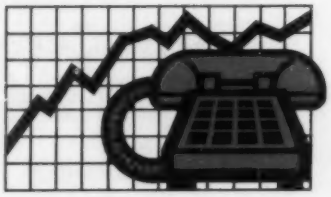
need for tax reform, leading to the 1986 legislation and the repeal of the investment tax credit.

Today, not all farmers favor its reinstatement. The investment tax credit, says Hrubovcak, attracted nonfarm investors, who represented a new problem for some farmers. Nonfarm investors used farming as a way to shelter nonfarm income from federal income taxes. Therefore, production of some agricultural commodities increased, putting downward pressure on prices.

On the other hand, farmers must invest periodically in machinery and other capital items to continue farming. The 1986 changes in the tax law have increased the cost of those investments. □

[Based primarily on information provided by economists Roger Conway, James Hrubovcak, and Michael LeBlanc of the Resources and Technology Division, and Ron Durst of the Agriculture and Rural Economy Division, Economic Research Service.]

Dialing Up Economic Information



Need economic information or data on today's, tomorrow's, or even yesterday's agriculture? The economists, statisticians, and other specialists of the Economic Research Service and National Agricultural Statistics Service may be able to help. Here is a brief telephone guide that you can pull out and add to your files. Generally, those listed with an "S" for "Statistics" can give you data on acreage, yield, production, livestock numbers, and stocks. Those identified with an "E" for "Economics" can help with supply-demand-price questions and other economic issues. All telephone numbers can be reached by dialing area code 202.

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Balance Sought Between Farm Chemicals, Water Quality

A delicate balancing act is beginning in earnest among Americans with a stake in agriculture—and water quality.

It is a complex situation involving apparent tradeoffs between productivity and the protection of the environment. These tradeoffs are likely to be resolved in the form of compromises that are partly political and partly economic.

The purpose would be to find an acceptable balance between sustaining a competitive agriculture and, at the same time, minimizing any contamination of the environment from the use of agricultural chemicals.

The farmer's interest here is broad and varied—involving health, more restrictions on chemical use, changing levels of profitability and production costs, and more intensive management.

Certainly, Americans don't expect farmers to stop using chemicals that have boosted yields, protected crops from insect and weed pests, and helped produce an abundance of affordable, nutritious food. On the other hand, few would question the need for reasonable use of farm chemicals in order to safeguard vital water supplies.

But beyond that general agreement, there may be little common ground on the specifics of how and where to restrict chemical use, and on what chemical residues are to be tolerated in the environment. In fact, there may be little reason to expect agreement when so many things—including the environmental and economic impacts of switching to alternative pest management strategies—are still unknown, and when so many goals compete for attention.

The tradeoffs, even among environmental goals, are confronted every day in American agriculture.

Take conservation tillage. Heralded as a way to save soil and cut production costs, it may be eroding another resource—groundwater supplies. That's because conservation tillage reduces runoff and increases percolation. Because of the ability of some herbicides to seep through soil, they may be more likely to contaminate groundwater supplies. Some proponents of conservation tillage acknowledge that potential groundwater contamination may be an unintended consequence of this erosion-reducing practice.

"The farmer will be the first to feel the economic effects of enforcing these laws, and others that may be enacted."

From Land to Water

Of course, using pesticides and fertilizers to maintain yields is common throughout agriculture.

According to economist Marc Ribaudo of USDA's Economic Research Service, agricultural runoff includes nitrogen and phosphorus residues from chemical fertilizers and animal wastes, pesticides, and sediment.

"Preparing land for crop production and the grazing of livestock may remove vegetative cover and disturb the soil, causing erosion," he says. Sediment washing off the land and into waterways can fill reservoirs, block navigation channels, interfere with water conveyance systems, affect aquatic plant life, and degrade recreational resources.

But it is pesticides and fertilizers, not sediment, that pose a particular concern because of their possible impacts on human health, Ribaudo notes.

"A portion of these chemicals used in agriculture may run off into surface water or leach into aquifers," he says. "Pesticides affect aquatic plant and animal life, and sufficient amounts in drinking water supplies may create a threat to human health. Nitrates from fertilizer in drinking water supplies can also be a human health risk."

As evidence of the presence of chemicals in groundwater accumulates, more farmers are questioning whether their livelihood may pose some risk to their health if current practices continue unchanged. While public water systems generally include treatment and monitoring facilities, farmers and their rural neighbors are more likely to depend on wells for drinking water.

The possible contamination of wells from chemicals that leach into groundwater supplies may prompt some farmers to reduce their use of chemical pesticides and fertilizers. Others may be trying nonchemical alternatives because they anticipate more restrictions on chemical use in the future and want to be ready, in practical terms, for the changes that will have to be made.

Chemical fertilizers and animal wastes, Ribaudo adds, also seem to spur the premature aging of lakes and estuaries, affecting recreational opportunities, municipal and industrial water supplies, and commercial fishing.

Areas Most Affected

Areas of the nation that appear to have more potential for contamination of groundwater from pesticides include the eastern seaboard, gulf coast, and upper Midwest. Among areas with the most potential for nitrate contamination are the Great Plains and parts of the Northwest, Southwest, and Corn Belt.

Surface waters can also be affected by agricultural activities.

"Nationally, agriculture is estimated to account for a little over half of the phosphorus and over 60 percent of the organic nitrogen discharged in surface waters each year from all sources," he says. "Where agriculture is very important, such as in the Corn Belt and Northern Plains, the percentages are higher," says Ribaudo.

Other evidence of agriculture's role comes from the U.S. Geological Survey, which examined water quality from 1974 to 1981. It found no firm evidence of increasing concentrations of organic nitrogen and phosphorus in surface water supplies in most surveyed areas. However, in areas where increasing concentrations of these materials were observed, they tended to be statistically related to agricultural activity, such as fertilizer use and livestock density, the economist says.

The 1974-81 period, Ribaudo says, "was characterized by a rapid expansion in the farm sector and a more intensive use of inputs. Clearly, the study suggests that decreases in the use of inputs and the acreage under production may reduce the concentrations of generic nitrogen and phosphorus."

Groundwater quality may be a more critical matter. The reason, says Ribaudo, is clear enough: More than 97 percent of rural America's drinking water is estimated to come from underground sources. "Also, about 40 percent of the population served by public water systems relies on groundwater. And it is estimated that nearly one-fourth of the U.S. population relies on groundwater pumped from areas with a combination of significant agricultural chemical use, and aquifers that may be vulnerable to contamination because of hydrogeologic characteristics."

The U.S. Environmental Protection Agency (EPA) will begin a National Pesticide Survey of well water this fall to help remedy the lack of information about groundwater quality.

"The extent and degree to which groundwater resources contain agricultural chemicals are unknown," Ribaudo says. "No national data base on pesticide or nutrient levels (fertilizer residues) in groundwater exists."

The EPA study will look at groundwater drinking wells for the presence of 41 agricultural pesticides that have potential for leaching into groundwater. Already, 12 pesticides have been found in well water samples in some areas. Individual states are also initiating groundwater monitoring programs to assess the potential danger to these resources.

Possible Changes for Agriculture

Protecting surface and groundwater resources may mean changes for agriculture, even under laws that are already on the books. The Water Quality Act of 1987, for example, requires states to indicate how they are controlling pollution problems related to agriculture.

"Under the act, each state must report to the EPA those navigable waters which cannot attain or maintain water quality standards without reducing agricultural and other nonpoint source pollution," Ribaudo says. Nonpoint source pollution is the term used to describe any pollution whose specific source cannot be identified.

"These reports must also identify the particular nonpoint pollutants and their sources, the best management practices for controlling them, and state and local programs to achieve control," he says.

States must also submit, for EPA approval, a management program for controlling the problem. The water quality law authorizes up to $400 million through 1991 to help states in this effort, which may include regulating land uses to protect surface water quality. States can use grants to address particularly difficult or serious nonpoint source problems and to implement innovative methods of meeting those problems.

Another law, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)—which may be strengthened this year by federal lawmakers—directs EPA to prevent "any unreasonable adverse effects" on people or the environment from pesticide use.

"If a pesticide poses a risk because of its potential effects on human health and its persistence in the environment," says Ribaudo, "or its ability to leach through the soil, the EPA may act to temporarily suspend or cancel its use."

That happened with the pesticide DBCP (dibromochloropropane), which was banned from all agricultural uses after it was found in wells in California and other states following its use on fruit and vegetable crops. Other pesticides, such as simazine, cyanazine, and aldicarb, have been restricted or locally banned because they leached into aquifers and presented a human health risk.

A third law—the Safe Drinking Water Act of 1974—promotes the protection of groundwater.

"States are required to develop programs to prevent contamination of groundwater around public wells," says Ribaudo. "One of the goals is to gain control over sources of contamination such as agricultural chemicals and animal waste." He says this law may have an impact on the use of agricultural chemicals in areas designated as critical.

States are also taking actions of their own. For instance, Kansas recently passed the Chemigation Safety Act to minimize the pollution threat from using agricultural chemicals in center pivot irrigation systems.

"The farmer will be the first to feel the economic effects of enforcing these laws, and others that may be enacted," says Ribaudo. "Banning or restricting certain pesticides to protect drinking water supplies may force farmers to shift to other pest control alternatives which are more expensive or less effective."

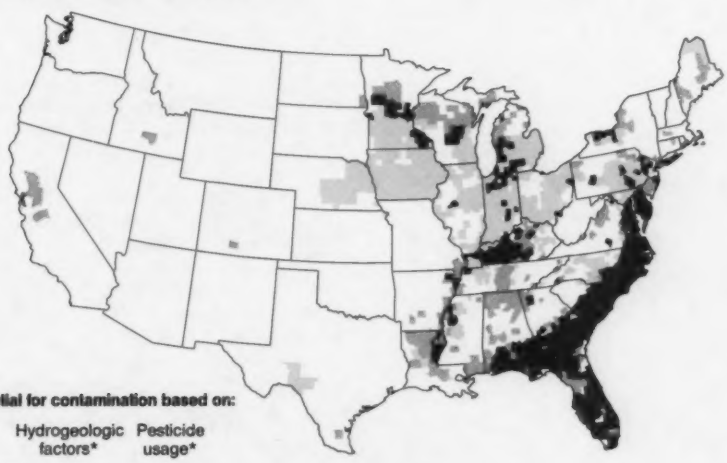
USDA is now investigating, among other things, the effects of using alternative pest management strategies on food production and the costs of farming.

Adopting New Practices

Additional restrictions could force farmers to adopt different practices that may affect production costs and yields.

(continued on next page)

The Potential for Groundwater Contamination from Pesticides Is Highest in the Eastern Half of the Nation*



Potential for contamination based on:

Hydrogeologic factors*	Pesticide usage*
High	High
High	Medium
Medium	High

*The hydrogeologic classification measures the relative vulnerability of groundwater to contamination based on an area's hydrogeologic characteristics. The pesticide usage classification is based on pesticide application estimates for states and counties made by Resources for the Future.

"The abrupt withdrawal of aldicarb from the market in New York created problems for potato growers who were hard pressed to find an adequate substitute to control the Colorado potato beetle," Ribaudo says. "And it was estimated that banning aldicarb in Wisconsin would have reduced potato yields by 15 to 25 percent."

Limits on fertilizer use and taxes on fertilizers are also viewed as ways to reduce chemical input in agriculture.

"These actions may reduce farm income if yields decrease or production costs increase," says Ribaudo. "Rural economies may be hurt if much of the agricultural production in an area operates under restrictions."

Overall, he says, any large-scale changes in farm production would be felt in the marketplace.

"One example of what might happen involves the triazine herbicides, which are widely used in corn," says Ribaudo. "These pesticides will be looked for in the EPA well water survey later this year. If they were banned, corn yields would decrease and prices would increase. In this case, farmers may benefit from increased prices, but the cost to consumers would be greater."

One positive note is struck by the possible improvements to water quality from some soil conservation measures contained in the 1985 farm bill, including the Conservation Reserve Program, conservation compliance, swampbuster, and sodbuster provisions of the law.

Under the Conservation Reserve Program, for example, new regulations have been issued to deal with the problem of water contamination from chemicals. The CRP is retiring highly erodible land into a 10-year reserve to reduce soil erosion. But the eligibility criteria have now been broadened to include features dealing with water quality concerns.

Now permitted entry under the CRP are "filter strips" of grass and trees to reduce pollution and sedimentation of streams, lakes, wetlands, and estuaries. Producers who have farmed near water for at least 2 of the last 5 years are eligible to receive federal CRP payments for planting and protecting such strips of land.

More legislation to protect water resources is on the congressional agenda, but there is also the sense of self-regulation on the part of farmers. Some analysts have suggested that if enough farmers develop filter strips, or take other actions to protect water quality, the need for more laws may be diminished.

EPA Seeks Advice On Clean-Water Plan

By fall, the U.S. Environmental Protection Agency may have in place an aggressive, long-term plan to protect groundwater from contamination from pesticides.

But, first, EPA is asking for advice from the public.

EPA is inviting comments from interested parties on its proposal for dealing with agricultural chemicals in groundwater. The proposed strategy may be obtained from EPA's public information center at the following address: U.S. Environmental Protection Agency, Public Information Center (PM-211B), 401 M Street SW, Washington, DC 20460. Comments will be accepted until June 25.

In brief, EPA's goal—as outlined in its proposal published in the February 26 *Federal Register*—is to manage the use of pesticides in order to guard groundwater resources.

"The EPA mission is focused on preventing groundwater contamination, or at least reducing the likelihood of such contamination," says Robert Barles, special assistant to the director of EPA's Office of Pesticides.

With that in mind, he says, EPA is proposing to tailor pesticide management in a federal-state partnership, bringing national "consistency" into play with state and local "flexibility."

The consistency would be supplied by federal standards for safe levels of pollutants in groundwater that is a current or potential source of drinking water. EPA would use something called MCL's (maximum contaminant levels) as its general benchmark or "reference point" for helping to determine what contamination levels are unacceptable. If an MCL has not been established, EPA will develop an interim reference point.

"In effect, EPA would be laying down a goal of protecting groundwater resources from unacceptable contamination, defining what is unacceptable depending on the groundwater's value and use, and directing the establishment of state plans to protect groundwater," says Barles.

Here's where state and local flexibility must be taken into account.

"The very real problem is that groundwater contamination is a very localized situation," says Barles. "There are so many factors to consider when designing a plan to safeguard groundwater—the vulnerability of groundwater, whether the groundwater is used for drinking water and household use or just for irrigation, the types of agriculture involved in an area, the types of pesticides applied, and how these pesticides are managed."

Of course, once contamination has occurred, the problem shifts to another level—that of restricting or banning certain pesticides, among other actions.

"However, national cancellations may not make sense," he says. "The risks and benefits of pesticides to a particular area and its groundwater resources have to be considered on a case-by-case basis."

This kind of state-local approach may already be catching on. In late February, Senators Dave Durenberger of Minnesota and Max Baucus of Montana introduced a bill that would provide state and local governments with some $425 million a year to help prevent contamination. The money would come from a tax on hazardous waste and solid waste disposal and on the sale of nonagricultural pesticides in the lawn and garden market.

Barles says public comments on the EPA proposal will be carefully considered by agency officials as they work to develop an effective strategy to deal with what is rapidly becoming recognized as an important national concern.

"Because there are so many laws regarding groundwater, we have to have a cohesive approach," he says. "We have to decide what the federal government must do and what states and local communities must do."

"If regulations are adopted that limit chemical use," says Ribaudo, "it is still likely they will be focused on critical areas rather than over wide regions. Individual farmers and local economies would therefore bear most of the costs of meeting water quality goals."

He stresses that only by banning or restricting the use of important pesticides would there be widespread impacts on production and prices.

"Whether these measures are taken will depend on how successful current laws and soil conservation programs are in improving and protecting water quality, and on what the nation is willing to pay to achieve these goals." □

[Based primarily on information provided by economist Marc Ribaudo of the Resources and Technology Division, Economic Research Service.]

Fighting Pests With Biopesticides, Fungus, and Cornstarch

How can farmers fight pests that plague their crops if certain chemical pesticides they now depend on are restricted by law?

One answer, in many cases, is other chemical pesticides that may also be effective against the same pests. Another possible answer may be provided by the emerging field of "biopesticides."

Biopesticides are naturally occurring substances such as bacteria that can be biologically engineered into new forms to do battle with insects and weeds that despoil crops.

So far, such formulations have made few inroads into the pesticide market. But give them time, say researchers, and biopesticides will slice off a significant share of the $4 billion world pesticide market.

To date, biopesticides have suffered from a number of drawbacks—they're difficult to produce and apply, delicate and short-lived in the field because of vulnerability to the sun's ultraviolet rays and to plant acidity, and not general enough to satisfy farmers who want pesticides to control several pests in one application.

With recent advances, though, biopesticides may be more widely applied. One basis for this hope is a bacteria found in more than 4,000 natural forms—*bacillus thuringien.*

Called BT, this bacteria produces a protein toxin that is deadly to certain insects. Expanding in the insects' digestive systems, BT kills by robbing them of their appetites.

The development of BT is also aided by the fine-tuning of fermentation techniques used to grow large amounts of bacteria, which makes the production process commercially feasible.

In addition, researchers have also found that BT may have wider applications desired by farmers. In tests, BT has been effective in killing caterpillars, beetles, weevils, mosquitoes, and moths.

Under streamlined standards issued by the EPA to make it easier to develop and market biopesticides, manufacturers can spend as little as $500,000 and 2 years of testing getting a new product approved.

One of the major tests of BT may come this year.

A San Diego company—Mycogen Corporation—expects to have EPA approval to sell its M-One Colorado potato beetle biopesticide. Farmers currently spend millions of dollars on pesticides to kill the Colorado potato beetle.

The same company is also hoping to market a protein "delivery system" for biopesticides derived from BT to keep these bacteria-based substances active for as long as five times the normal duration.

The delivery system would be a kind of naturally produced gelatin capsule shielding the BT toxin from ultraviolet rays and plant acidity—the two elements that break down biopesticide effectiveness and which continue to limit the appeal of biopesticides to farmers.

On the horizon are further breakthroughs in biopesticides, say scientists, including the use of gene-splicing methods to bolster the durability of BT and other microbes in the field.

And then there's cornstarch, which may help reduce the water-contaminating potential of the traditional chemical pesticides.

Typically, cornstarch comes to the rescue in the kitchen, where it is used to thicken gravy. But it may have important applications to agriculture—not to fight pests but to fight the harmful effects of pesticides on groundwater supplies.

USDA scientists are using cornstarch to encapsulate various weed killers and insecticides for controlled release. When it gets wet, the cornstarch slowly releases the chemicals, and cornstarch-covered pesticides also tend to percolate more slowly in the soil. This means that pesticides are held near the soil surface where microbial activity is highest. The microbial activity breaks down the chemicals before they can move more deeply into the soil, decreasing the opportunity for groundwater contamination.

Other promising research points to possible ways of using nature to fight insect and weed damage and thereby reduce the need for agricultural chemicals: a tiny parasitic wasp that could inject caterpillars with lethal crystals, a predator fly that kills insects which attack Hawaiian pine trees, and a weed-destroying fungus discovered in Mongolia.

In these and other ways, scientists are searching for safer means of keeping crops free of insect and weed pests. In this search, they are depending on specific spinoffs from genetic engineering to develop micro-organisms that attack certain insects, microbes that degrade toxic chemicals to harmless forms, and plants equipped with genes—the basic units of heredity—that allow them to resist insects and diseases.

Wisconsin Farmers Alter Income Mix

Wisconsin farmers whose income from agriculture dipped in the early 1980's generally were able to make up for the lost dollars by increasing their off-farm employment and income, according to an eight-county survey in the southwestern part of the state.

Researchers surveyed 529 farmers twice, once in 1983, just before the worst of the bad times hit Wisconsin agriculture, and again in 1987, after many of the effects of the farm recession had abated. About 20 percent of the farmers in the sample left farming between 1982 and 1986, the years actually covered by the survey questions. Almost half of those were retired or disabled, and all but one of the remainder had nonfarm employment in 1986.

Total farm household income in the survey averaged $28,421 in 1982 and $31,165 in 1986, says sociologist Susan Bentley of USDA's Economic Research Service. When adjustments are made for inflation, there is no significant difference between these income figures. Average income from off-farm jobs and other sources increased by almost $5,000, while farm income decreased by $2,212, leaving a net increase in total farm household income of about $2,700. In 1986, net cash farm operating income accounted for 43 percent of total household income, down from 55 percent in 1982.

This pattern held true for various farm sizes, although large dairy farms reported the least change in income sources.

About one-third of all the surveyed farm operators and just under half of the spouses and other adults in the households had off-farm jobs in 1986. More than 14 percent of the farmers and 17.5 percent of the spouses had full-time jobs off the farm. In 1982, 12 percent of the farmers and 12.7 percent of the spouses had full-time, off-farm jobs.

The researchers found that off-farm earnings were related to levels of formal education. Wages earned by farmers with less than 8 years of schooling were less than half as much per hour, on average, as wages of those with more than 12 years. The average off-farm hourly wage for all farmers surveyed was $10.09. Spouses earned an average hourly wage of $6.71.

One-fifth of the 529 farmers surveyed quit farming between 1982 and 1986, 80 percent of those who quit stayed in their communities, and over half of those remained in the same houses they occupied while farming.

Bentley analyzed the survey data with University of Wisconsin researchers William Saupe and Brian Gould. They plan to continue their analysis, comparing the financial situations of farmers who have not left farming with those who have. They will study poverty in Wisconsin farm households and changes in the poverty status of those households over the survey period. They also plan to learn more about the types of off-farm jobs that farm family members have and about changes in farm operations.

Gleanings

THERE ARE NO WORLD FOOD PROBLEMS, but there are problems of hunger in the world, says Economic Research Service economist Harold Stults. Stults is not trying to divert attention away from the hunger and malnutrition that persist in parts of Africa, Asia, and Latin America. Instead, he is addressing the apparent paradox of hunger amidst plenty. Part of the explanation, he maintains, can be found in the lessons learned about "food security" since World War II.

"At first," Stults says, "food security was seen mainly as a production problem. To reduce hunger, increase production. Initially, emphasis was on high-yielding varieties. Dramatic crop yield increases gave rise to the term 'green revolution.' When new varieties alone did not accomplish expected results, more attention was directed to other inputs, like fertilizer, irrigation, and machinery."

Total world food production increased more than fast enough to keep up with population growth, yet hunger continued, he says. "Problems with inadequate infrastructure and marketing institutions were addressed with mixed success. Massive amounts of food aid were provided, mostly from the United States. At times, distribution problems resulted in waste and inefficiency. In some areas, prices to domestic producers declined as a result of food aid. This lowered farmers' incentives, reducing investment and eventually production. Gradually, it became clear that even if solutions were found for production and marketing problems, the world would still not have total food security. Being able to produce and market food may be necessary conditions for food security, but they are not sufficient."

"Hunger," he says, "is not so much the result of poor weather, poor resources, or even poor institutions—although these can and do cause hunger. Hunger is the result of poor people. And the reasons people are poor are many."

Even after 40 years of experience in trying to address food security issues, experts hold different opinions on the solutions to the related problems of hunger and poverty. Some analysts, Stults says, emphasize internal economic reform, including more equitable land distribution, more jobs, and higher real wages in areas where hunger persists. Others emphasize closer economic and political ties between the richer and poorer nations, with greater cooperation and stepped-up transfers of technology, capital, and food. Still others see the pricing of agricultural commodities as possibly the most effective tool for stimulating food production and improving the incomes—and buying power—of the Third World's rural poor.

According to Stults, the search for solutions is unlikely to end with one, all-encompassing answer. Effective solutions seem to require cooperative actions by both the affluent and the poor nations—actions involving the trade, aid, and

One of the most important lessons is that world hunger is more often caused by poverty—the inability to buy food—than by any generalized food shortages. As fundamental as it seems, this lesson had to be learned through experience, says economist Harold Stults.

economic policies of the former, and internal economic and political reform in the latter. However, effective solutions also presuppose the political will to take the necessary actions, he adds.

Sometimes poverty and need in a particular nation are the consequences of drought, recession, or the lack of resources and expertise. In such cases, the answer may be found by combining food and development aid with improved incentives and technologies in production and marketing. But often, he says, the "acts of people" represent the most formidable and unyielding obstacles. War, repression, corruption, discrimination, greed, inflexible policies, closed markets, and the politicization of food and development assistance all share in the responsibility.

"President Kennedy may have been right," says Stults, "when he said that we have the means to eliminate hunger from the face of the world, but need only the will. To succeed, individual nations will have to muster the political will to cooperate in this goal, and their efforts must be properly directed. So far, we seem to be making more progress on the global food production problem than on the social and political problems that keep people poor. Although production is essential, more food doesn't necessarily mean less hunger. It is now apparent that we must work at solving the problems that cause poverty with at least as much energy and commitment as we bring to the task of growing more food."

Leaders. . .

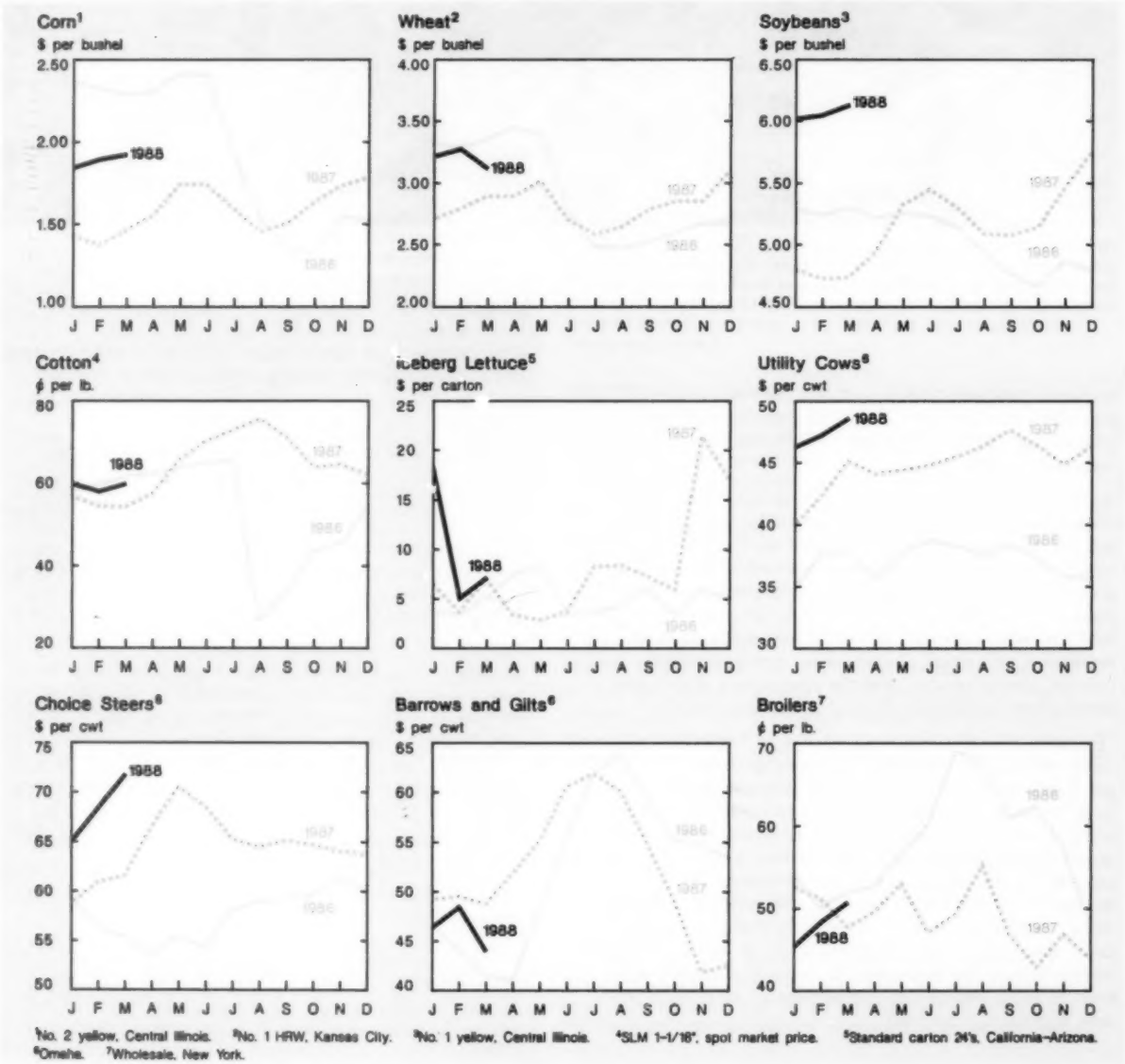
U.S. Chicken and Turkey Meat Exports Climbed Sharply in 1987, with Gains to Many of Our Leading Markets

Leading markets for U.S. chicken[1]	U.S. export volume		Leading markets for U.S. turkey[1]	U.S. export volume	
	1986	1987		1986	1987
	millions of lbs.[2]			thousands of lbs.[2]	
Japan	167.6	172.0	West Germany	2,637	4,692
Iraq	0.	128.9	Canada	3,603	3,617
Hong Kong	77.8	120.6	Taiwan	38	3,436
Egypt	55.3	57.7	Egypt	5,627	2,631
Singapore	53.5	52.4	Japan	2,418	2,118
Canada	39.6	50.4	Hong Kong	1,137	1,947
Jamaica	55.7	43.9	Mexico	1,233	1,846
Mexico	33.4	30.5	Micronesia	0	1,243
Leeward-Windward Is.	22.9	23.4	Western Samoa	1,780	1,239
Netherland Antilles	11.7	18.2	Marshall Is.	0	1,111
Spain	3.6	11.5	Jamaica	150	832
French Pacific Is.	9.9	11.1	Haiti	445	738
Saudi Arabia	44.4	4.7	French Pacific Is.	66	682
Dominican Rep.	2.3	3.6	Leeward-Windward Is.	513	668
Bahamas	2.6	3.1	Bahamas	854	529
World total[3]	582.5	767.1	World total[3]	26,639	33,097

[1]Rankings of markets are based on 1987 exports. [2]Does not include live animals in most cases or further processed products, such as chicken or turkey franks. [3]World totals reflect sales to all markets.
Data provided by economist Larry Witucki of the Economic Research Service.

Monthly Price Monitor

USDA's March 1988 index of farm prices was unchanged from February but was 7.4% above its year-earlier level. Corn rose for the 6th straight month, reaching $1.92 per bushel. Wheat dropped 16¢ to $3.11. Soybeans gained 8¢ per bushel to $6.12, the highest since August 1984. Cotton was up 2¢ to 59.7¢ per lb. Among meat animals, utility cow prices increased $1.37 to an unusually high $48.53 per cwt. Choice steers gained more than $3 for the second straight month, climbing to $71.68, the highest since May 1982. Barrows and gilts tumbled $4.50 per cwt to $43.86, while broilers rose to 50.6¢ per lb. after 6 months of below-50¢ prices. All prices shown are monthly averages.



[1]No. 2 yellow, Central Illinois. [2]No. 1 HRW, Kansas City. [3]No. 1 yellow, Central Illinois. [4]SLM 1-1/16", spot market price. [5]Standard carton 24's, California-Arizona. [6]Omaha. [7]Wholesale, New York.

Who's First?

Rankings of the Top Farm States by Selected Characteristics

	1st	2nd	3rd	4th	5th	6th	7th	8th
Number of farms, June 1, 1987 (farms) U.S. total: 2,173,410 farms	Texas 160,000	Missouri 114,000	Iowa 107,000	Kentucky 99,000	Tennessee 96,000	Minnesota 92,000	Ohio[1] 84,000	Illinois[1] 84,000
Land in farms, June 1, 1987 (acres, in thousands) U.S. total: 1,002,463,000 acres	Texas 133,200	Montana 60,900	Kansas 47,900	Nebraska 47,200	New Mexico 44,600	South Dakota 44,500	North Dakota 40,500	Arizona 37,000
Average farm size, June 1, 1987 (avg. acres per farm) U.S. average: 461 acres	Arizona 4,405	Wyoming 4,000	Nevada 3,667	New Mexico 3,304	Montana 2,609	Alaska 2,121	South Dakota 1,271	Colorado 1,269
Total value of farm real estate (land & buildings), Feb. 1, 1987 (millions of dollars) U.S. total: $549,781,000,000[2]	Texas 64,539	California 44,820	Illinois 29,856	Iowa 25,136	Florida 19,033	Missouri 16,938	Kansas 16,304	Nebraska 15,810
Farm real estate values per acre, Feb. 1, 1987[3] (avg. value, $ per acre) U.S. average: $548 per acre[2]	New Jersey 5,321	Rhode Island 4,217	Connecticut 4,056	Massachusetts 2,999	Maryland 1,831	New Hampshire 1,794	Delaware 1,775	Pennsylvania 1,725
Acres planted to principal field crops, 1987 (acres, in thousands) U.S. total: 304,528,000 acres	Iowa 24,586	Illinois 22,059	Kansas 20,267	North Dakota 20,163	Minnesota 19,305	Texas 17,636	Nebraska 16,477	South Dakota 15,167
Number of cattle & calves, Jan. 1, 1988 (thousand head) U.S. total: 98,994,000 head	Texas 13,500	Kansas 5,950	Nebraska 5,450	Oklahoma 5,050	California[1] 4,600	Iowa[1] 4,600	Missouri 4,250	Wisconsin 4,230
Number of hogs & pigs, Dec. 1, 1987 (thousand head) U.S. total: 53,795,000 head	Iowa 13,800	Illinois 5,300	Indiana 4,600	Minnesota 4,350	Nebraska 4,000	Missouri 2,950	North Carolina 2,500	Ohio 2,150
Broiler production, 1986 (millions of birds) U.S. total: 4,646,312,000 birds	Arkansas 787	Georgia 697	Alabama 588	North Carolina 451	Mississippi 336	Maryland 264	Texas 239	Delaware 197
Number of sheep & lambs, Jan. 1, 1988 (thousand head) U.S. total: 10,774,000 head	Texas 1,960	California 1,015	Wyoming 865	Colorado 860	South Dakota 610	Montana 538	Oregon 490	Utah 478
Cash receipts from crop marketings, 1986 (millions of dollars) U.S. total: $63,611,917,000	California 9,602	Illinois 4,737	Iowa 4,124	Florida 3,686	Texas 2,928	Minnesota 2,679	Nebraska 2,669	Indiana 2,258
Cash receipts from marketings of livestock products, 1986 (millions of dollars) U.S. total: $71,572,715,000	Texas 5,516	Iowa 4,982	California 4,556	Nebraska 4,260	Wisconsin 4,164	Kansas 3,447	Minnesota 3,395	Pennsylvania 2,239
Direct government payments to farmers, 1986 (millions of dollars) U.S. total: $11,813,351,000	Iowa 1,161	Texas 978	Illinois 883	Kansas 871	Nebraska 868	Minnesota 802	North Dakota 700	Indiana 411
Net cash income from farming, 1986 (millions of dollars) U.S. total: $51,993,000,000	California 5,034	Iowa 3,595	Texas 2,984	Illinois 2,727	Nebraska 2,674	Minnesota 2,625	Florida 2,261	Wisconsin 2,102

[1]Because the state data are equal, the ranking is based on the previous year's numbers. [2]Excludes Alaska and Hawaii. [3]Data not available for Hawaii.

Data are from the Economic Research Service and National Agricultural Statistics Service.

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